The activities of the committee have been far-reaching. Attention has been given to the encouragement of researches already in progress, and it has initiated many fresh inquiries. It has got into touch with colleges and technical institutes, and collected information as to the facilities for research and the supply of research workers. But the main work of the committee has consisted in a most exhaustive survey of the problems retarding the development of existing industries, and of the research work necessary for the establishment of new industries. It would be almost tedious to enumerate the subjects which have received attention; no industry has been neglected, but perhaps special attention has been devoted to the agricultural and pastoral industries.

Some very sound principles are again and again emphasised in the course of the report. The necessity of securing a greater supply of skilled research workers is frequently referred to, and the committee has made a beginning in the way of encouraging promising students to take up such work by finding remunerative employment for some of the men at present available.

A second point which is regarded as of great importance is the improved training of artisans in technical schools. If research methods are to be more generally applied to industries, it is clear that greater skill and accuracy will be required from the general body of workers, so that it is not merely the duty of the universities and colleges to supply highly trained research workers, but the technical schools have also the important duty of educating the artisan for the new type of work required under the new conditions.

We detect here and there in the report a tendency on the part of the committee not to wait for an industry to come to them, and, indeed, not even to delay in order to secure the co-operation of the industry, but to get research work going when convinced of the necessity for it. For example, the Executive Committee decided to appoint a special committee to investigate the processes of extraction of tannin from wattle bark, and feeling that negotiations with the tanners in all the States would take too long, the investigations have been commenced without waiting for financial assistance from the industry. This method of procedure is interesting, and one would like to get further information as to whether the committee intends to publish freely the results of such investigations, or whether it is going to communicate them to firms on certain conditions.

The present report is in the main confined to a survey of the promising fields for research work, and does not deal with questions connected with the administration of public funds. Most people will probably regard it as of good omen for the success of the scheme in Australia that research, and not administration, is being given the premier place, although no doubt the authorities of the institute will find it very necessary to formulate some guiding principles. In the attempt to apply science to industry it is, however, quite clear that the result will be fatal if we take too great care to avoid a few mistakes and thus set up a system with a tendency to damp the enthusiast.

There is one respect in which the present report is rather peculiar. As we have stated, it is in the main a survey of the field for future work, but in describing the proceedings of several of the sub-committees there is included an account of the experimental results obtained in some of the researches that have been started. The effect produced is scarcely satisfactory, as the researches are only in their initial stages, and it is not possible to give definite conclusions. The public should not be encouraged to expect results of importance to industry too soon, and when given they should be stated as definitely as possible.

The Executive Committee has evidently carried out its duties with great thoroughness, and has made a very complete survey of Australian industries. In matters relating to agriculture and stock breeding the work of the Australian Institute promises to be of special interest to the mother country if we are really determined to apply science to agriculture in a systematic way in the future.

NOTES.

WE are very glad that the Government has been induced to abandon the intention to use the British Museum at Bloomsbury for the purposes of the Air Board and the Natural History Museum at South Kensington for other Government departments. Lord Sudeley directed attention to the proposed appropriation of these buildings in a question asked in the House of Lords on January 9, and, in reply, Earl Curzon said that, as regards the British Museum, he was glad to state that for the accommodation of the Air Ministry it was no longer necessary to appropriate that building. As to the Natural History Museum, it had been found, after detailed examination, that any attempt to convert the galleries into public offices would involve the closing of the building to the public, extensive internal rearrangements, and the consumption of an enormous amount of labour and material and very considerable delay. In these circumstances it had been decided that there was no necessity sufficiently urgent to warrant the use of the museum as had been contemplated.—This decision has given much satisfaction to all who cherish regard for national prestige and understand the intellectual stimulus or practical value of the collections in our national museums. What astonishes us, however, is that Sir Alfred Mond, the First Commissioner of Works, and a son of the late Dr. Ludwig Mond, should have placed himself in such an indefensible position by putting the scheme before the Government. It is difficult to comprehend also why, before deciding to requisition the building, the Government did not inquire as to whether such action was imperatively needed, and consult the trustees and other responsible authorities as to what its consequences would be. If that had been done, a storm of protest would have been saved, and Earl Curzon would not have had to confess in the House of Lords that there was no real necessity for the proposed occupation, which would, indeed, have been more like the act of an invader than of a Government entrusted with the care of national interests in every direction. The trustees of the museum, at their meeting on January 12, expressed their gratitude, on behalf of the nation whose treasures they hold in trust, to the newspapers which so unanimously gave voice to the public disapproval of a proposal which threatened the safety of the museum and its collections.

REPORTS and opinions relating to the "capture" of 257 recipes for manufacturing dyes produced by the Badische Company appeared in the *Daily Mail* of January 10 and following days, and the subject has been much commented on by other journals. It has been rightly pointed out that the view that the knowledge thus gained will enable us after the war to compete with Germany in every line of dyed goods is too sanguine, and that, although the possession of these recipes may undoubtedly be of considerable assistance, it is a comparatively small item in the general scheme that it is necessary should be organised for the satisfactory establishment of the dye industry in this country. The provision of buildings, plant, and labour is not easy under war conditions, and, of course, more chemists and engineers are required. Were all these readily available, however, it is doubtful whether the inexpert organisations controlling most of the undertakings in England could hope to establish one of the most scientific of industries. In the extensive literature on this subject that has appeared during the last three years the necessity for chemists, engineers, and plant has been repeatedly urged, but the outstanding feature of the great German organisations, namely, that the boards of directors can, and do, direct their businesses, seems to have been overlooked. If, as is suggested, the Government can be induced to acquire these 257 recipes for the benefit of the nation an admirable opportunity will arise of organising the industry as a whole. More than twenty firms are now advertising the sale of dyes manufactured by themselves, but it is evident that each has started independently, with the result that the majority are making "sulphide" dyes. Unless some mutual arrangement can be made according to which the whole field of manufacture is divided out in order to prevent undue overlapping and to provide a wide range of products, many of these praiseworthy beginnings will inevitably come to an early end.

THE following official announcement was made on Monday:—It is with great regret that the Secretary of State for War has decided that the time has come when Surgeon-General Sir Alfred Keogh, G.C.B., Director-General of Army Medical Services, must be permitted to resume his duties as General Executive Officer to the Imperial College of Science and Technology, and he will be replaced at the War Office from March 1 next by Col. T. H. J. C. Goodwin, Royal Army Medical Corps, until recently the Assistant Director of Medical Services to the British Recruiting Mission in America, who will be appointed Acting Director-General of Army Medical Services. Sir Alfred Keogh's services were placed by the governors of the Imperial College of Science and Technology at the disposal of the War Office at the beginning of the war, and, although during the last three years they have on several occasions requested that he should return to his former duties owing to the development of matters of great national urgency which are delayed by his absence, it has not hitherto been possible to spare him. It is very largely due to Sir A. Keogh's intimate knowledge and grasp of all matters connected with the Army Medical Services and the medical profession generally that the medical needs of the Army have been met to the fullest extent during the war, and he has been able to secure the assistance and advice of various committees of eminent consultants, which it is hoped will continue to be at the disposal of his successor.—We understand that Sir Alfred Keogh has for some time desired to return to his work at the Imperial College. The Royal Army Medical Corps as it now exists is essentially his creation, and his organisation of it to the present state of efficiency and strength is a high testimony to his great administrative powers and an achievement of which the nation is justly proud.

THE National Museum of Wales has received an important addition to its collections through the gift by Lord Rhondda of the "Rippon" collection of insects, shells, and minerals. The late Mr. Robert H. F. Rippon was an enthusiastic and careful collector, and is well known to entomologists as the author and illustrator of "Icones Ornithopterorum." By dint of assiduous labour during more than forty years he accumulated very extensive collections, which are especially rich in Lepidoptera; there are more than 3000 specimens of Papilionidæ and more than 5000 of Nymphalidæ, the whole insect collection consisting of above 100,000 specimens. In addition to the more showy forms, such as the cones, cowries, olives, volutes, and the like, the shells include a long series of land shells from the tropics and the islands of the Pacific Ocean. As these collections are mainly exotic, they will supplement, and not duplicate, those already in the museum, which are for the most part British. It remains to be added that the specimens are in excellent condition, and the localities have in almost all cases been recorded. Another welcome gift recently received by the museum has been the British Hemiptera, Neuroptera, and allied groups from the "Briggs" collection, which were presented by Mr. Ernest Heath.

WHAT has been done to make use of waste stores in the Army is described in a reply given by Mr. Bonar Law to a question asked by Mr. Herbert Samuel, chairman of the Select Committee on National Expenditure. A Salvage Board has been formed, with the Quartermaster-General as chairman, to deal with the use and disposal of all waste stores. The following are amongst the results achieved:—(1) From waste fats collected from Army camps alone have been produced: (i) Tallow sufficient to provide soap for the entire needs of the Army, Navy, and Government Departments, with a surplus for public use, producing an actual revenue of about 960,000*l.* per annum, in addition to saving valuable tonnage; (ii) 1800 tons of glycerine for ammunition sufficient to provide the propellant for 18,000,000 18-pr. shells. The glycerine costs the Government 59*l.* 10*s.* per ton as compared with 300*l.* per ton, the price of imported glycerine. (2) Well above 1,000,000*l.* worth of military rags have been recovered and used in the manufacture of new cloth and blankets for the Army. (3) Many thousands of pounds' worth of cuttings from cotton textiles have also been recovered and utilised in connection with munition and aeroplane requirements. (4) Some hundreds of thousands of pounds' worth of condemned boots have, after the expenditure of some labour in sorting and minor repairs at very small cost, been sold for distribution among the labouring classes, agricultural and industrial

AMONG the changes recently announced as having been made at the Admiralty one has reference to the organisation of the Admiralty Board of Invention and Research. The object of the change is to secure greater concentration of effort in connection with scientific research, and to ensure that the men of science who are giving their assistance to the Admiralty are more constantly in touch with the problems upon which they are advising. Mr. C. H. Merz, the electrical consulting engineer, who has been associated with the Board of Invention and Research since its inception, has consented to serve as Director of Experiments and Research (unpaid) at the Admiralty to direct and supervise all the executive arrangements in connection with the organisation of scientific research. Mr. Merz will also be a member of the Central Committee of the Board of Invention and Research under the presidency of Admiral of the Fleet Lord Fisher. The functions of the Central Committee will, we learn from the *Times,* as hitherto, be to initiate, investigate, develop, and advise generally upon proposals in respect to the application of science and engineering to naval warfare; but the scientific experts at present giving their services will in future work much more closely with the technical departments of the Admiralty immediately concerned with the production and use of apparatus required for specific purposes. The general arrangements in regard to the organisation of scientific research will in future come under the direct supervision of the First Lord of the Admiralty.

THE *Times* of January 8 contained a letter from Profs. J. Stanley Gardiner and G. H. F. Nuttall on the applicability of the method of preserving herrings by freezing in brine, and on January 10 Mr. J. M. Tabor had a letter dealing with the process from the commercial point of view; a further letter in the *Times* of January 14 appeared from Profs. Gardiner and Nuttall. The method suggested by the last-named is evidently the Otteson method developed and worked in Norway, Sweden, and Holland. It was investigated by Mr. H. Bull, of the Norwegian Fisheries Bureau, and later by a commission of three experts appointed by the German Government. There is a very good account of the process and its effect on the tissues of fish in the *Fish Trades Gazette* of October 20 last. The fish are frozen rapidly in solutions of salt in water of such strengths that the temperature can be reduced to 6·8° F. if necessary. "Glazing" by the formation of an ice film occurs and prevents osmotic interchange, and the rapidity of the freezing produces very small ice-crystals between the muscle-fibres, instead of the large crystals which are mainly responsible for the deterioration of the flesh. Experiments on a commercial scale were made at Fleetwood and elsewhere in this country in 1917, and successful results were obtained, so much so that it was claimed by the writer of the article in the *Fish Trades Gazette* that the very difficult problem of refrigeration of sea fishes had been completely solved, and strong recommendations were made for its commercial adoption. It is suitable for most species of fish, but herrings and some others require rather careful handling, and gutting is probably necessary. Mr. Tabor's letter in the *Times* directs attention to the practical side of the matter, suggesting difficulties that are, just now, very formidable. A further, very useful contribution to this important discussion is contained in the leading article of the *Fish Trades Gazette* of January 12.

ACCORDING to a note in *L'Economista d'Italia* for January 1, an eminent Brazilian geologist has been commissioned by his Government to investigate the deposits of oxide of zirconium in the Caldas region (Minas Geraes), as well as to carry out further work to ascertain the extent of the coal formations in the State of São Paulo.

THE presentation of the Thomson Foundation gold medal of the Royal Geographical Society of Queensland was made to Dr. Griffith Taylor on November 8 last for his thesis on "The Settlement of Tropical Australia," which deals specially with the control of crops and health in relation to temperature and rainfall. The progress made in the settlement of this part of Australia is also compared with that of other tropical areas.

MR. R. BULLEN NEWTON, F.G.S., of the Geological Department, British Museum, has just completed fifty years of Government service. Shortly after entering on his official career, which commenced on January 6, 1868, Mr. Newton became one of the assistant naturalists of the Geological Survey under Prof. Huxley. He was transferred to the British Museum in August, 1880. His numerous published researches on various branches of palæontology, especially the Mollusca and Foraminifera, have had a direct bearing on the geology, both theoretical and economic, of widely scattered regions. Mr. Newton has been president of the Malacological Society of London and of the Conchological Society of Great Britain and Ireland.

THE buildings of Dalhousie University suffered severely in the recent explosion on the munitions ship which wrecked the northern part of the city of Halifax, N.S., on December 6 last. Nearly all the windows in the medical school were blown in, and much material in the laboratories was destroyed. The new science buildings and library suffered almost worse damage. On the day following the disaster there was a blizzard, during which much snow was driven into the buildings before the windows could be boarded up. The damage is being rapidly repaired, and arrangements are being made to continue the session this month. No members of the staff were injured. Prof. Fraser Harris has been asked by the military authorities to undertake the duties of historian of the medical aspect of the recent disaster.

THE death is announced, at sixty-seven years of age, of Mr. J. E. Cullum, late superintendent of the Valencia Observatory, Ireland.

THE *Morning Post* announces the death, at thirty-nine years of age, of Mr. H. L. Burgess, medical secretary to the Advisory Medical and Sanitary Committee for Tropical Africa and to the Yellow Fever (West Africa) Commission.

THE annual meetings of the Institution of Naval Architects will be held on March 20–21, in the hall of the Royal Society of Arts. The Right Hon. the Earl of Durham, president, will occupy the chair. A gold medal will be awarded by the council to any person, not being a member or associate member of council, who shall at the forthcoming meetings read a paper which, in the judgment of the council, is deemed to be of exceptional merit.

WE learn from the January issue of the *Observatory* the announcements of the deaths of M. S. Javelle, astronomer at the Nice Observatory, and Dr. E. Kron, junior observer at the Potsdam Observatory. The following particulars of their careers are extracted from obituary notices in our contemporary:—M. Javelle was born at Lyons in 1864, and joined the staff of the Nice Observatory in 1884. He assisted Thollon in his solar researches and Perrotin in his double-star observations. In 1889 the great equatorial was placed in his charge, and remained so until his death. He made many observations of comets and minor planets, but his principal work was the discovery of more than two thousand faint nebulæ.—Dr. Kron was killed on October 24 last in Flanders, where he was serving as oberleutnant and battery commander. Born in 1881, after graduating at the Berlin University he was appointed assistant at Potsdam in 1906, and at first was engaged upon the measurement of the plates in the Potsdam zone of the Astrographic Catalogue. In 1910 he accompanied Prof. Müller on the Potsdam eclipse expedition to Teneriffe. His most important work was also carried out in conjunction with Prof. Müller—the photometric Durchmusterung of the polar zone +80° to +90°. On the outbreak of war Dr. Kron was engaged upon this work, and also upon an important investigation of the absorption of rays of short wave-length in the earth's atmosphere, using a quartz spectrograph.

News of the death of Dr. Jean Clunet, a victim to typhus in Rumania, has recently reached us. The greater part of Dr. Clunet's scientific work was devoted to the subject of malignant disease. He was the author of "Tumeurs Malignes," a volume filled with new experimental data, mostly original, upon the forms and varieties of tumours, the evolution of neoplastic growths, and the action of X-rays upon malignant tumours, human and animal. Dr. Clunet devoted a great amount of labour to these latter investigations, and he was able to show the various stages of degeneration through which malignant cells pass after adequate exposure to X-rays. Perhaps his most important work was the production of malignant tumours in rats by exposing them to repeated doses of X-rays. On two occasions he produced tumours in rats which satisfied two of the criteria of malignancy, viz. histological conformation to malignant type of cell and successful propagation with other normal rats. Since the outbreak of war Dr. Clunet had served in a medical capacity, at first with his regiment, and afterwards in some special capacity at the Dardanelles, with the Serbian Army at Corfu, and finally upon a mission of hygiene to the Rumanian Army. His scientific publications during the war include "La jaunisse des camps et l'épidémie de paratyphoïde des Dardanelles" and "La relation des accidents nerveux émotionnels, observés chez les naufrages de la Provence." Dr. Clunet was made an honorary corresponding member of the Röntgen Society in 1913. Those who had the privilege of knowing him deplore the loss of a life so full of promise of deeds to come.

Kew Bulletin, Nos. 7 and 8, published together, are occupied entirely with a list of economic plants, native or suitable for cultivation in the British Empire. The list is prefaced by some introductory remarks by Dr. A. B. Rendle, keeper of the Department of Botany, British Museum, South Kensington, explaining the origin and object of the list. The suggestion of the publication of the list arose at the British Association meeting, 1916, of which Dr. Rendle was president of Section K, and as Kew contained so much economic information in its museums, its preparation there was most fitting. In the list many well-known and already cultivated plants are mentioned, and references are given to the more important papers dealing with particular products, but there are many little-known plants to which reference is made which may be of value for future developments. Under every plant the country of origin is given and some particulars of its use. The plants are arranged under the products they yield, such as fatty oils, gums, etc.; rubber, gutta-percha, and balata; drugs, dyeing and tanning materials; paper-making materials and timbers.

The botany and physical geography of the Holy Land are of considerable interest at the present time in connection with the campaign in Palestine, and the article on the subject from the pen of the veteran botanist, Mr. J. G. Baker, published in the *Gardeners' Chronicle* for December 22 and 29, 1917, is most opportune. Several good illustrations add to the interest of the text. Though so small a tract of country, the flora, owing to the diverse physical features, is remarkably rich, comprising some 4000 species, exclusive of the lower plants, such as mosses and fungi. Boissier's "Flora Orientalis" is, of course, the classic work on this region, and additions to the list have been made by Sir Joseph Hooker and Sir Daniel Hanbury. The subtropical region of the Jordan Valley and southern deserts contains many forms unknown further to the west. Then there is the flora of the rich loamy coastal plains, with the limestone promontory of Mount Carmel; the mountain region of Lebanon and Antilebanon, above 4000 ft., rising on Lebanon to 10,000 ft., and here, as in N. Africa, the familiar Arctic-Alpine plants, found so far south as the Caucasus, are not represented, though they extend through to the mountains of Central Asia and the Himalayas. Lists of the more interesting plants are given for the different regions. Palestine in its botany combines in a remarkable manner the characters of the East and the West, but the abnormal feature of the Jordan Valley and the Dead Sea, deeply excavated below sea-level, constitutes, both florally and geologically, its most interesting feature.

The Advisory Council of Science and Industry of the Commonwealth of Australia appointed in August, 1916, a special committee to consider the problem of worm nodule disease in cattle, which is a source of serious loss to the Australian meat industry. The report of this committee has now been published as Bulletin No. 2 of the Advisory Council. The bulletin includes a report on the occurrence of onchocerciasis in cattle and associated animals in countries other than Australia, and also a translation of an article by M. Piettre on bovine onchocerciasis in South America. Further sections deal with Australian investigations, some of which have been recently dealt with here. The committee makes recommendations for a generous provision of assistance for further investigations.

In the *Journal of Agricultural Research* (vol. xi., No. 7) Messrs. W. Moore and J. J. Willaman give an account of studies in greenhouse fumigation with hydrocyanic acid. Evidence was obtained that the fumigated plants absorbed more or less of the gas, which led to a reduction in the activity of the oxydases and catalase, and, hence, in respiratory activity. This resulted further in an inhibition of photosynthesis and translocation of carbohydrate, and a closing of the stomata. Another result was an increase in the permeability of the leaf septa, with consequent less rapid intake of water from the stems and more rapid cuticular transpiration. In cases of mild fumigation this resulted in merely a temporary wilting, and the subsequent recovery was followed in many cases by a rate of growth and of fruit production (in the tomato) in excess of the normal. Within a few hours after fumigation oxydase activity had returned to normal, while the catalase and the respiratory activities exceeded the normal. By this time the recovery of photosynthetic action was first apparent; complete recovery, however, of this and of translocation of food material was not attained until after an interval of from two to three days. Respiration remained above normal for several days. The stimulation of growth may be due to at least two factors—namely, to the increased activity of the catalase and to the increased permeability of the cell-walls, allowing readier exchange of food materials and of gases. It is very improbable that the extra nitrogen contributed by the cyanide exercises any direct nutritive effect.

In a paper which has appeared in the Proceedings of the Tokyo Mathematico-Physical Society (1916, p. 513, and 1917, p. 208) Prof. H. Nagaoka has taken up the theory of the concave grating in order to determine the errors introduced when a wide grating is used. He finds that the resolving power of concave gratings is far less than that of flat gratings of the same width. As, however, the utilisation of the whole power of a plane grating necessitates the use of a collimating telescope of large size, the best plan seems to be to construct concave gratings of very small curvature. The results of investigations of the structure of spectral lines with the concave gratings hitherto available have been inferior to those obtained by interference methods giving the same resolving power. But the latter methods are in turn subject to the drawback that the order of the spectrum for a particular constituent observed may not be identical with that of the principal line of the group under investigation.

At the meeting of the Scottish Meteorological Society on December 20 last, a paper was read on ground-ice by Dr. John Aitken. It was pointed out that as ice cannot begin to form unless the water is cooled 2° or 3° below freezing point, any radiation effect from the bottom of rivers could never start the freezing there. An experiment was described in which ice was formed in running water by the action of radiation and cold air. The ice so produced was in small crystals, or frazil-ice, and was found attached to the bottom and to obstructions in the stream, the same as observed in rivers. This ice, when massed, was of a soft, spongy nature, like ground-ice. Observations made where there is ground-ice show that the very slight heating of the sun's rays soon causes it to loose its attachment to the bottom and rise to the surface. It is shown that this is due to the ice crystals slipping when the temperature is just above freezing point, and adhering when it is just under it. The difference measured on the thermometric scale is infinitesimal, though the physical results are enormous. While frazil-ice gives great trouble by adhering to the hecks of inlets at power stations, none has been experienced from it adhering to the guide-blades in the turbines. This difference, it is pointed out, is due to the water at the inlets being on the cold side of the freezing point, while in the turbines it is just above it, owing to its being under greater pressure and the ice melting.

Prof. M. Tiffeneau informs us that the first volume of the correspondence of Charles Gerhardt, the centenary of whose birth was celebrated by the Chemical Society of France in December last, will be published in a few weeks' time. This volume will contain fifty-eight letters from Auguste Laurent and twenty from Gerhardt, between the dates 1844 and 1852. It is hoped that two other volumes of Gerhardt's correspondence will appear during this year. The complete work will contain five hundred letters exchanged, for the most part, with the chief chemists in Europe during a period—1837 to 1856—which, from the point of view of chemical science, was of the highest historical significance. The publisher of the three volumes will be M. P. Masson, 120 boul. Saint-Germain, Paris, and the price will be about fifteen francs per volume, or thirty-two francs for the set if this sum is subscribed before the end of the present year.

One of the difficulties with which railway maintenance engineers have to contend is creeping of the rails in a longitudinal direction, which necessitates periodic rectification of the position of the rails after the creep has taken place. Two papers were read on this subject at the Institution of Civil Engineers on January 8. In one of these papers Mr. H. P. Miles describes investigations of this phenomenon made by him for a period of five years in this country on a line consisting of 850 track miles of main and branch lines, over which various kinds of traffic passed. In the other paper Mr. F. Reeves describes some simple experiments he has carried out on pine, iron, and rubber laths by causing loaded wheels to roll along them. He concludes that creep is due primarily to deformation of the rail as the wheel passes over it, and that the more violent the deformation, the greater will be the creep; thus creep is increased by increasing the wheel load, and also by diminishing the rigidity of the rail, either by reducing its section or by using a weaker material. The weight of the wheel appears to be the most powerful factor affecting the amount of creep. Creep is accentuated by braking, and is greater downhill than up-hill, but is by no means absent on the latter. Creep is always with the traffic. Creep can be resisted more or less completely by putting in enough anchorage or resistance, and Mr. Reeves describes several such devices, including one of his own design which is in use on the Buenos Ayres and Pacific Railway. Many railway structures are affected by creep, and their design should take it into consideration. This requires special emphasis in the drawing office.

OUR ASTRONOMICAL COLUMN.

The Masses of the Stars. The masses of all the double stars for which sufficient data are available have recently been calculated by Prof. H. N. Russell (*Popular Astronomy*, vol. xxv., p. 666). The results for the mean mass of a pair of stars, grouped according to the spectral classes of the bright components, are summarised in the following table, the unit being the mass of the sun:—

Spectrum	Spectroscopic binaries		Visual binaries		Physical pairs		From parallactic motions	
	No.	Mass	No.	Mass	No.	Mass	No.	Mass
B0–B5 … …	13	17·5			8	10·4	36	7·1
B8–A5 … …	18	4·0	6	5·9	12	3·0	114	8·4
F–G "giant" …	34	3·9					37	8·1
K–M ,, …							38	9·8
F–F5 "dwarf"…			17	3·5	9	3·4	60	2·5
F8–K0 ,, …			21	1·8	10	1·4	51	0·7
K5–M ,, …			4	0·7	8	1·0		

The first three groups present quite independent data, but the fourth, though for the most part independent, includes stars of the second and third groups. The giant stars of all spectral classes are thus shown to be nearly equal in mass, as they are in brightness. Among the dwarf stars, however, where the luminosity falls off rapidly with increasing redness, the mean mass also falls off, but much more slowly. The masses of the stars thus seem to be more closely related to absolute magnitudes than to spectral types; that is, the brighter stars are the more massive. This result is in accordance with Prof. Russell's view that only the more massive stars can attain great luminosity in the course of their evolution.

The Spectrum of α Canum Venaticorum.—It was discovered by Belopolsky a few years ago that certain lines in the spectrum of α Canum Venaticorum were alternately visible and invisible, and the same observer found later that such lines could be arranged in two groups. In a brief report in *Popular Astronomy* (vol. xxv., p. 656) it is stated that the spectrum has been further investigated at the Detroit Observatory by Mr. C. C. Kiess, who has obtained sixty-seven photographs, and has determined the wave-lengths of more than two hundred faint lines. The star is classed